

Project SeaMonitor: Developing an understanding of the early phase of the marine migration of Atlantic salmon (*Salmo salar*) post-smolts from multiple rivers in the British Isles



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SeaMonitor



- Atlantic salmon



National Geographic

- Flapper skate

- Basking shark

- Rehabilitated harbour seals

- Cetaceans



NatureScot



WildRepublic

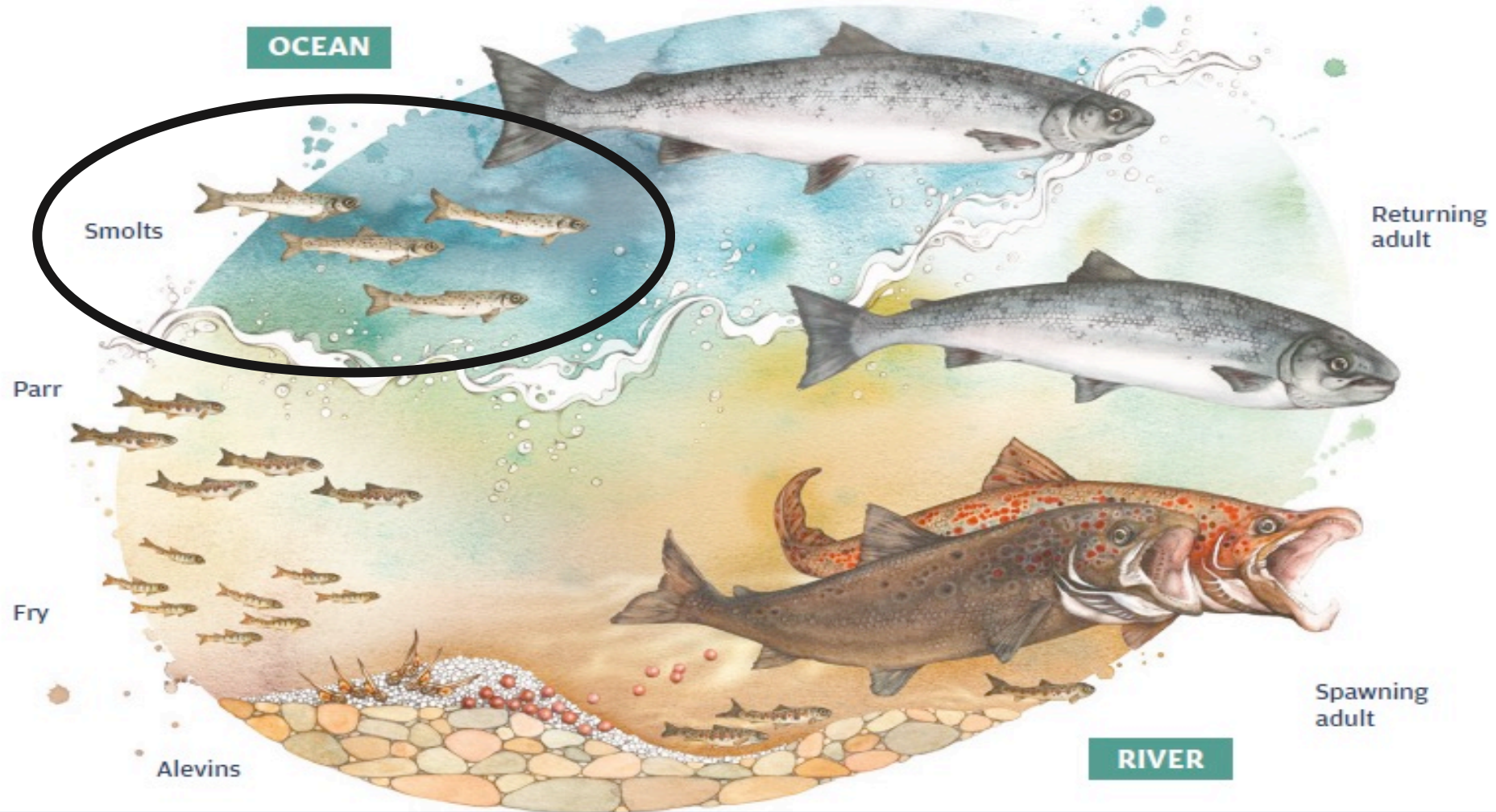


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Life cycle

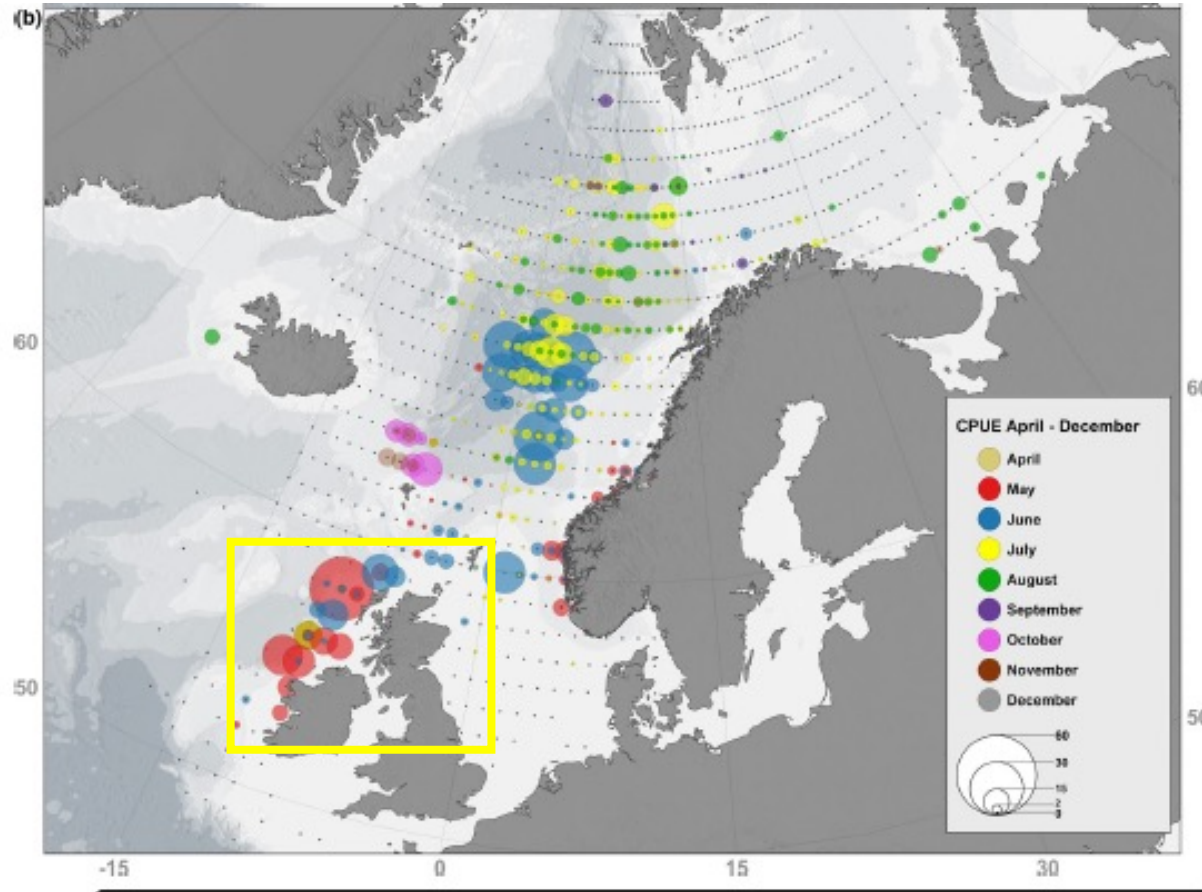
Salmon at sea

1,2,3

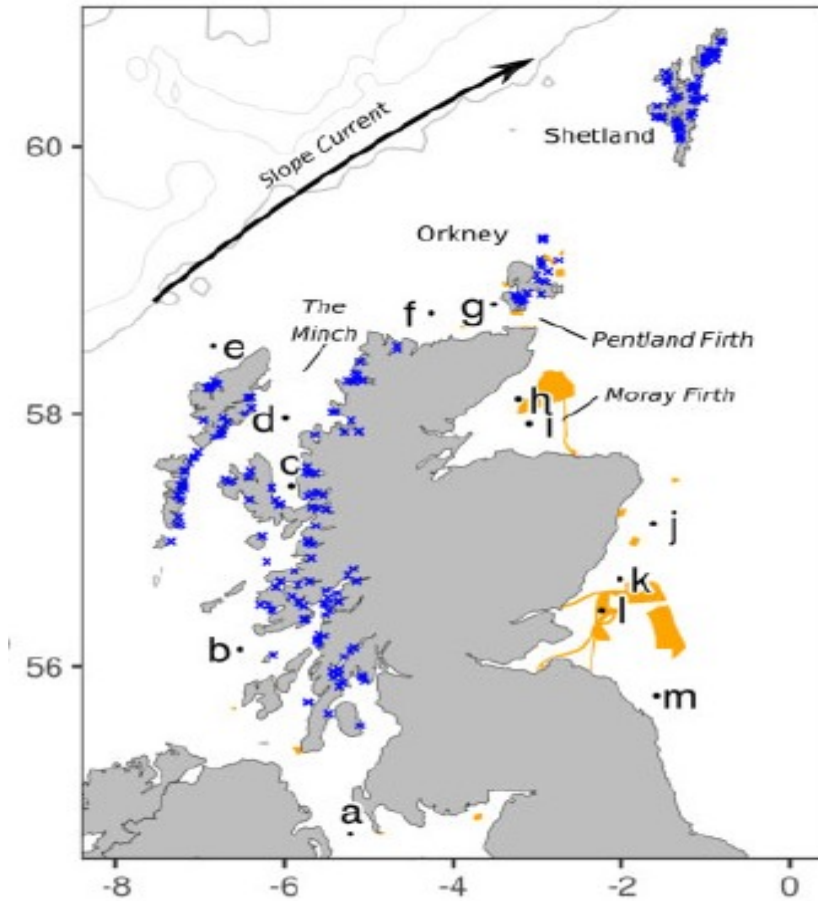


Migratory cues

4



5,6,7



Objectives

1. Early marine loss rate

1. ↑ Migration distance
2. ↑ Smaller smolts
3. ↑ Entry date

2. Migratory pathways

1. Within/between nations
2. Overlap with potential stressors

3. Environmental drivers of movement

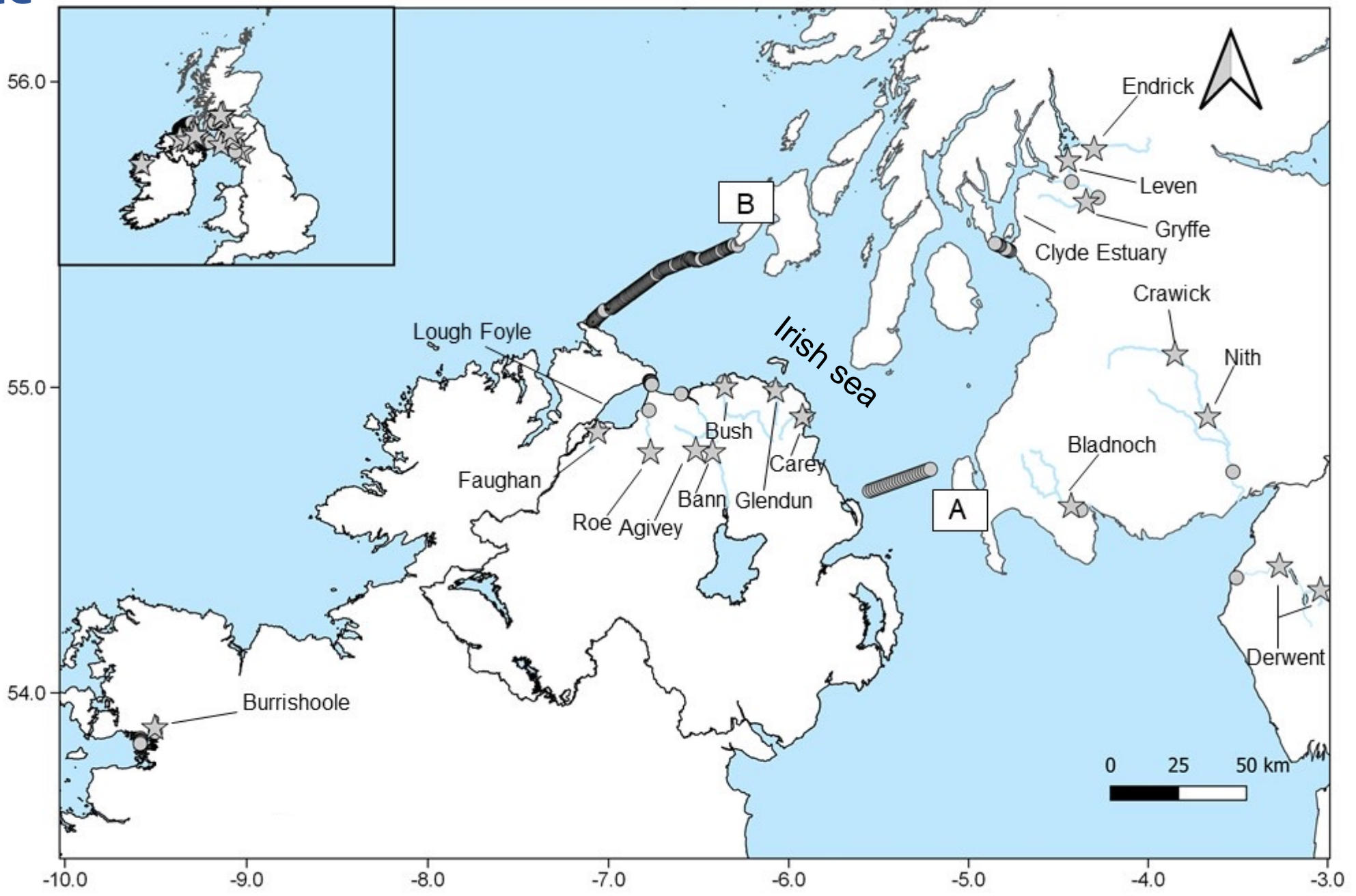
1. Movements not driven by tide

Main outcome:

- Management plans for Foyle and Clyde Atlantic salmon

Study site

14 rivers
1069 smolts
163 receivers



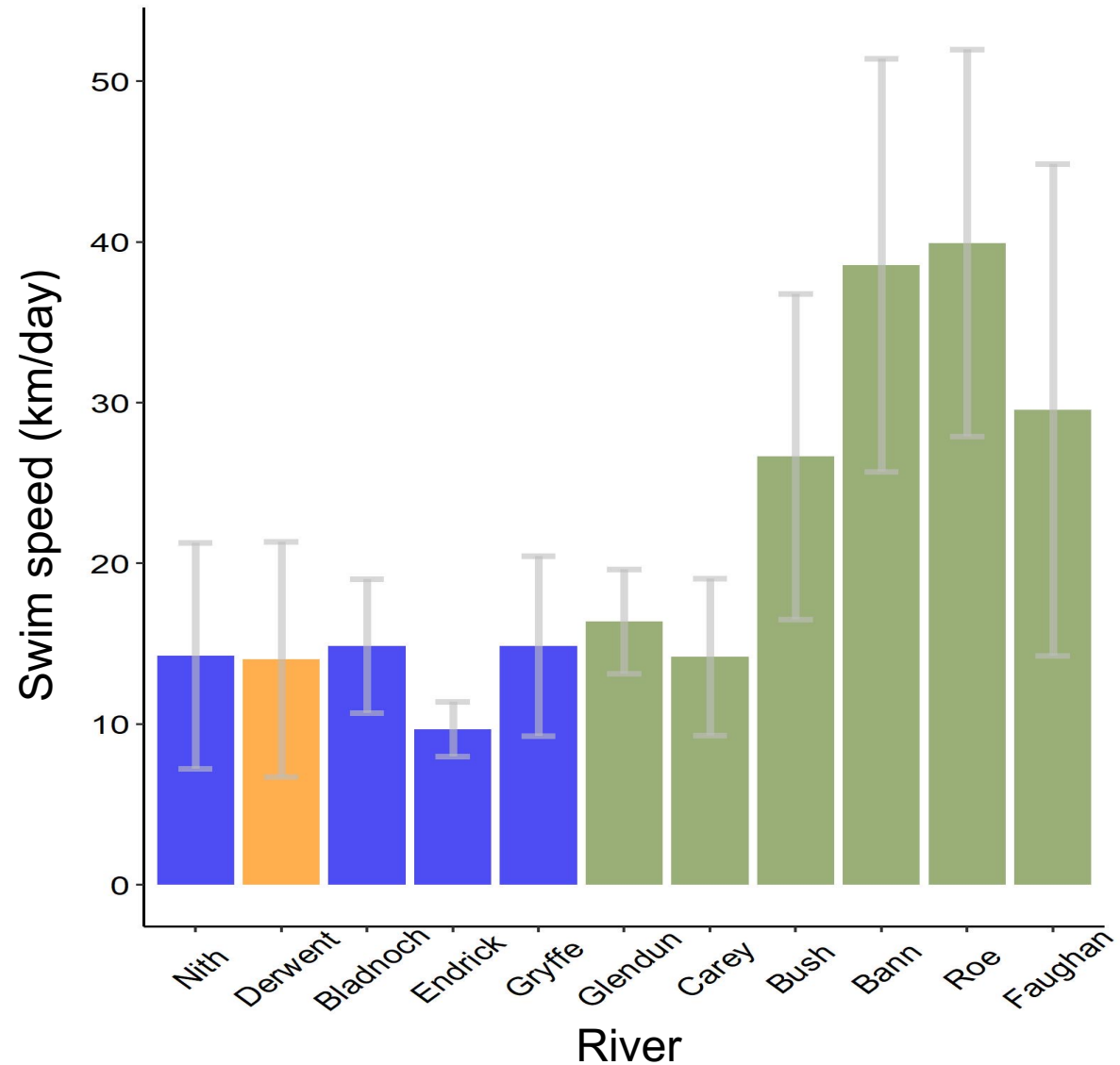
Migration metrics

Scotland

England

N.Ireland

River	Distance travelled (km)
Nith	278
Derwent	256
Bladnoch	238
Endrick	168
Gryffe	168
Glendun	83
Carey	60
Bush	47
Bann	46
Roe	38
Faughan	38



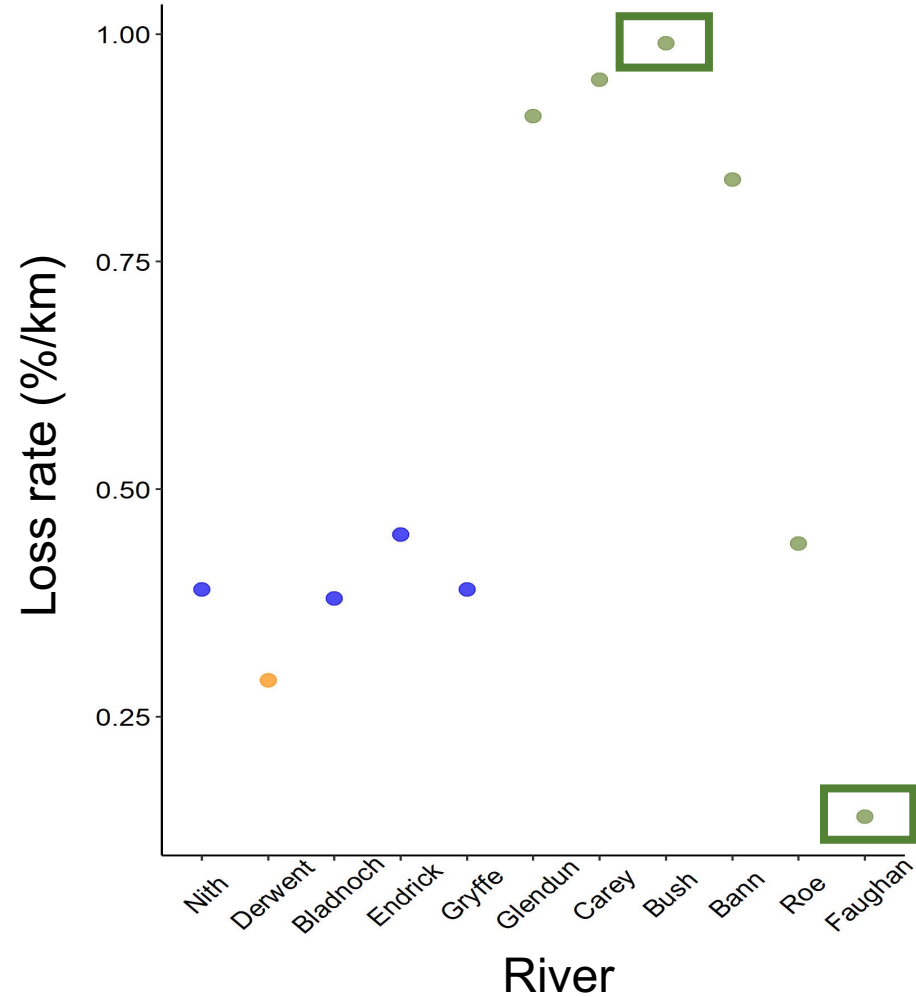
Is overall loss dependent on total distance travelled?

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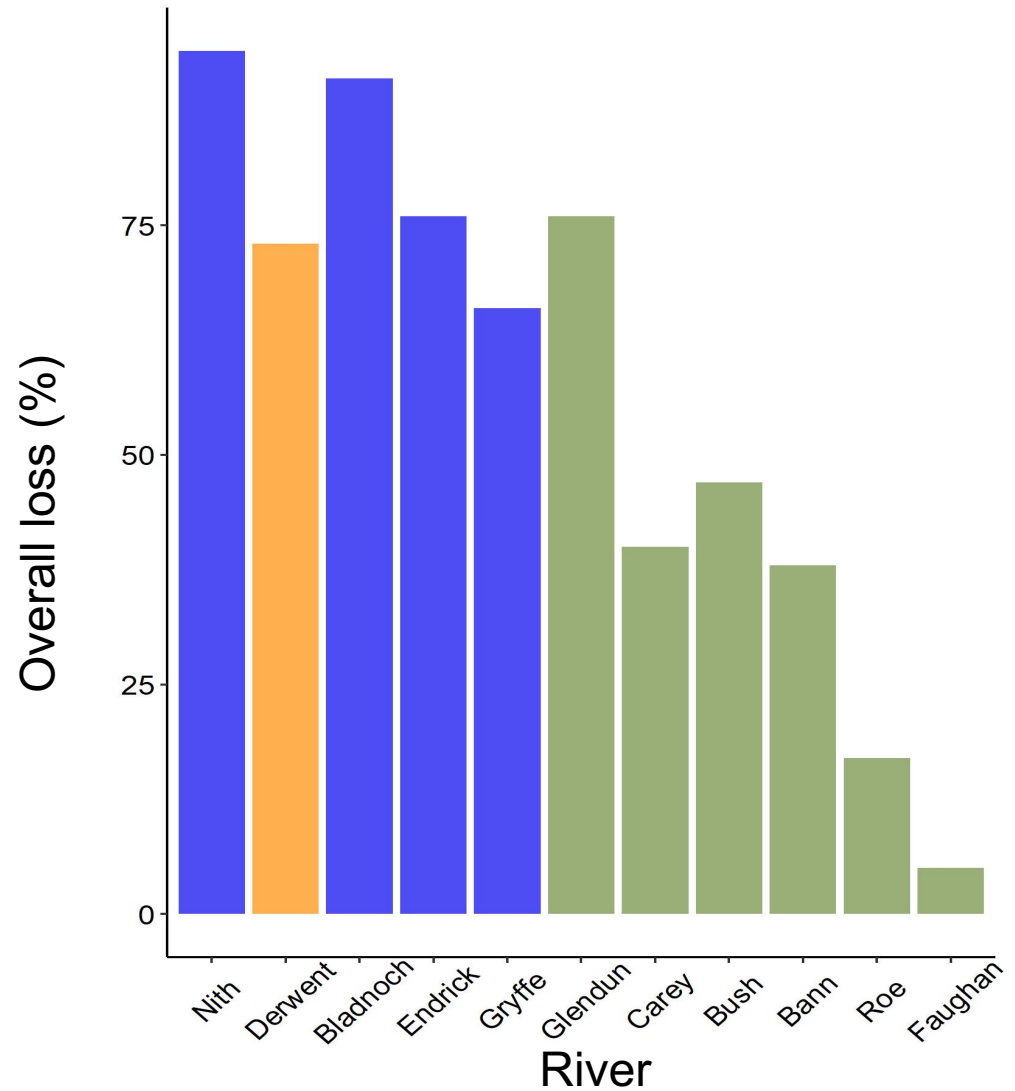
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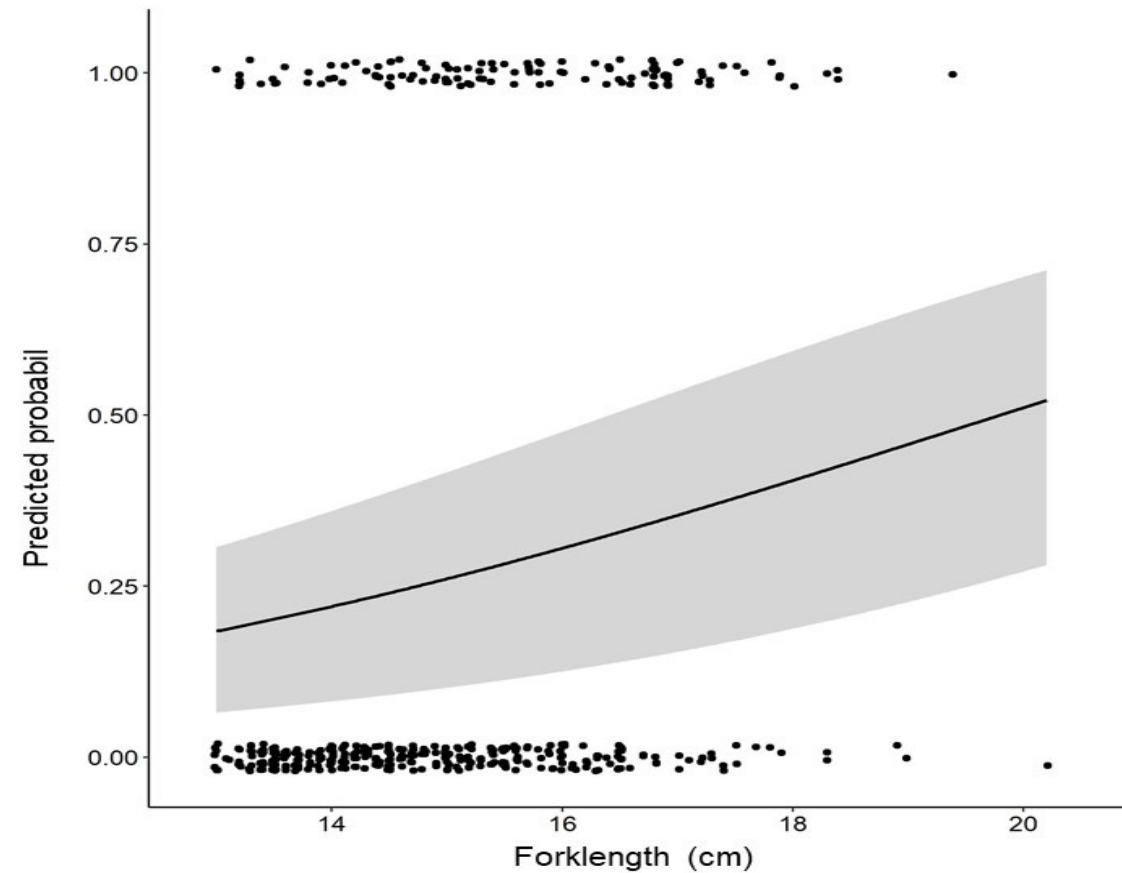


Is migration success dependent on physiological or behavioural characteristics?

Initial model: Migration success \sim FL + Weight + condition factor (K) + tag burden + decimal date of entry + $(1/River)$

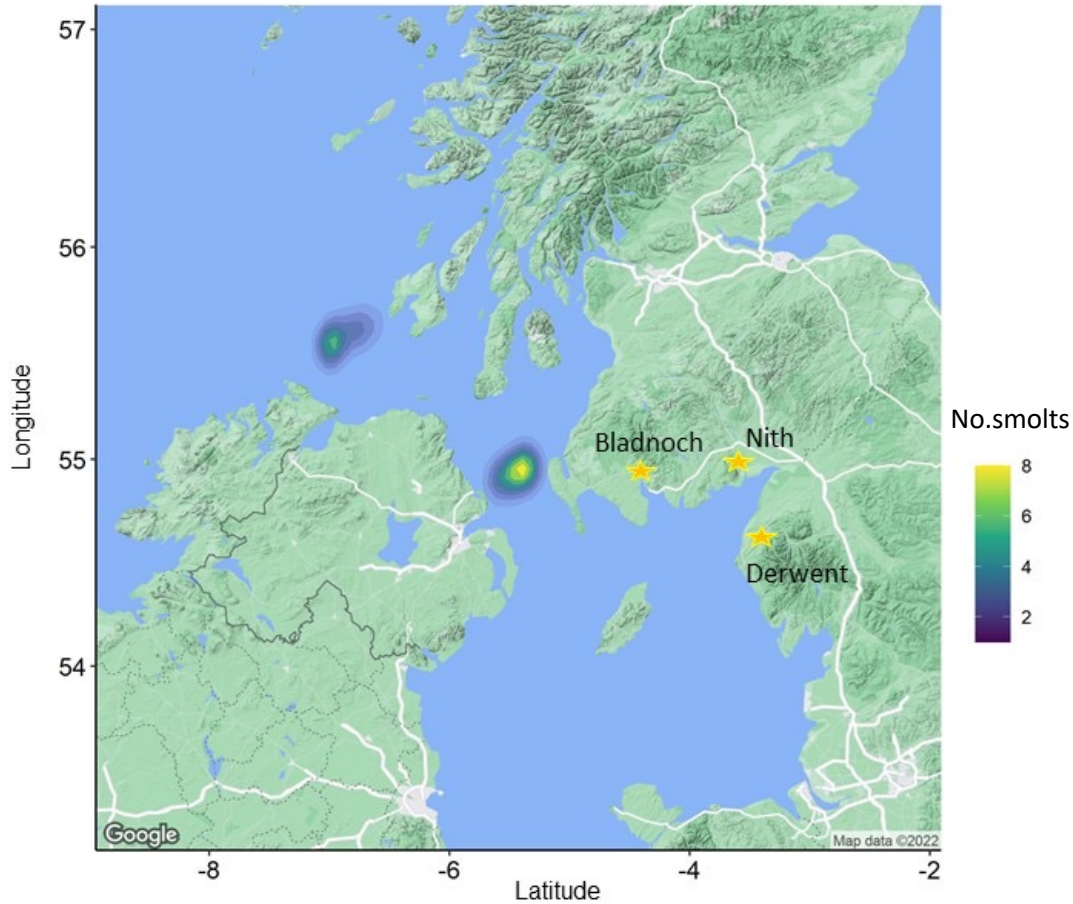
Significant predictor:

- FL, value = 0.24, $p = 0.05$
- Variation explained by FL = 3%
- Variation explained by River = 16%

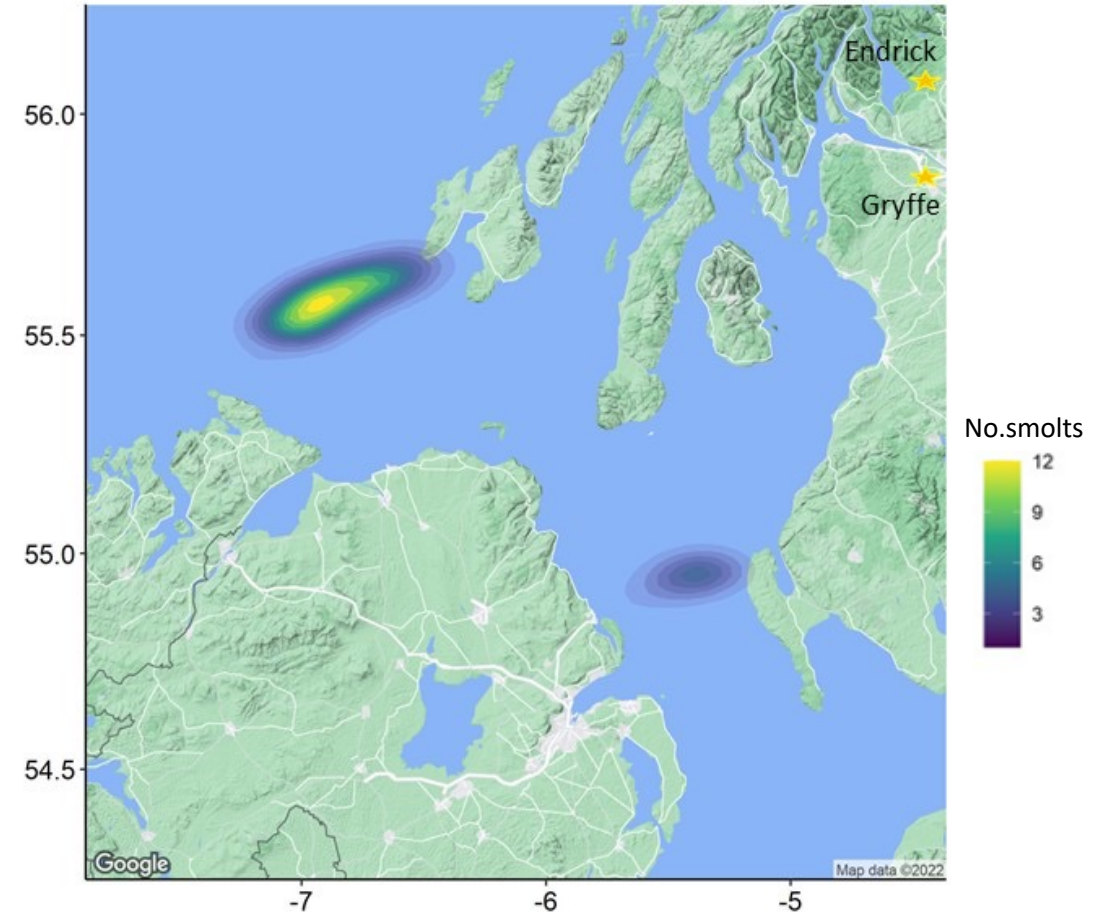


Distribution – Scotland/England

Region 1 (Nith,Bladnoch,Derwent)

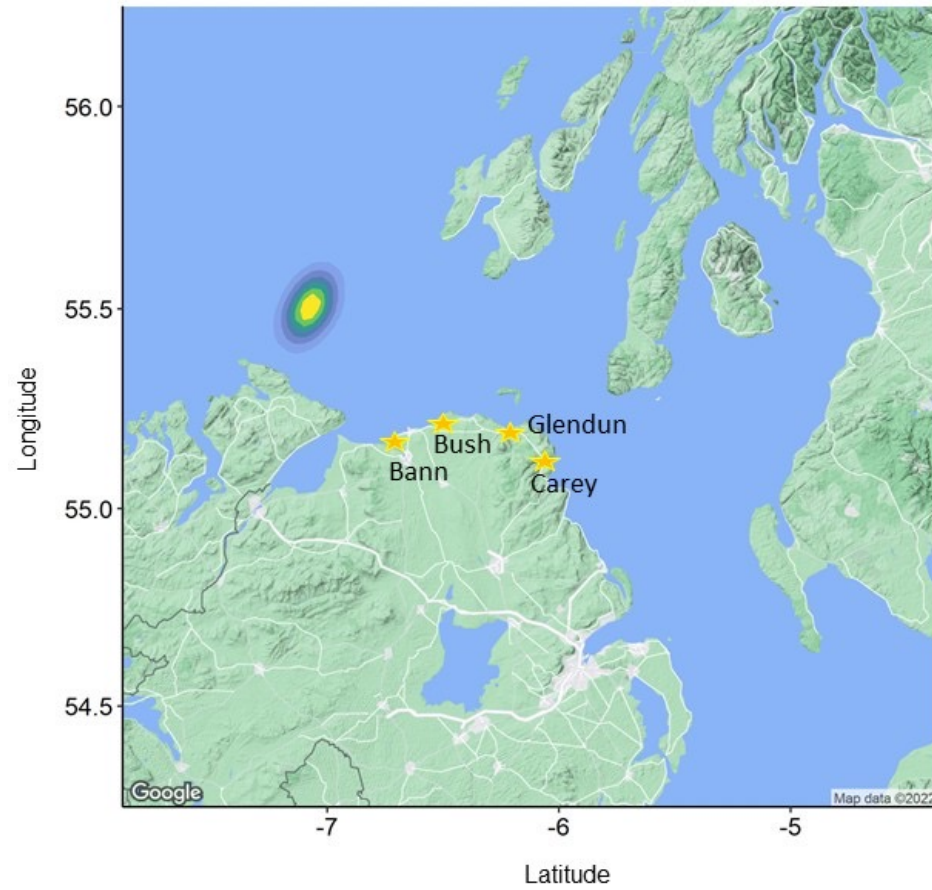


Region 2 (Endrick/Gryffe)

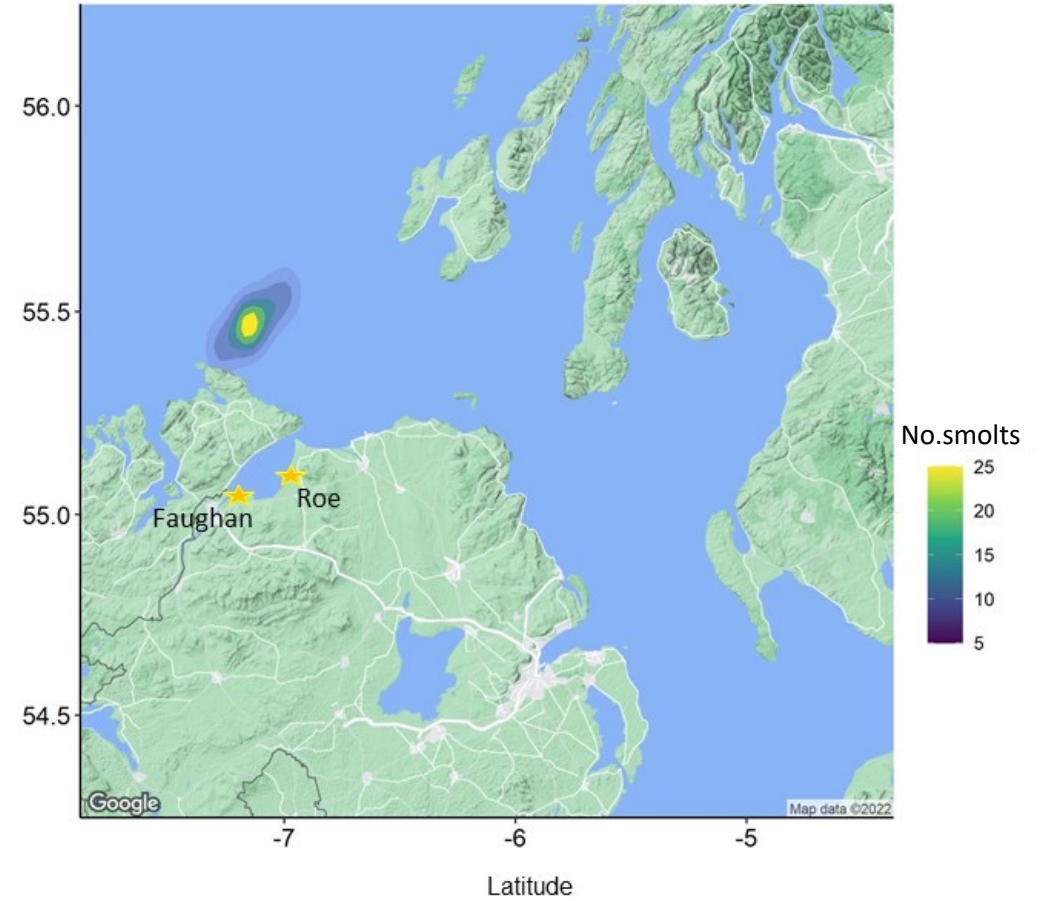


Distribution- Northern Ireland

Region 3 (Bann,Bush,Carey,Glendun)

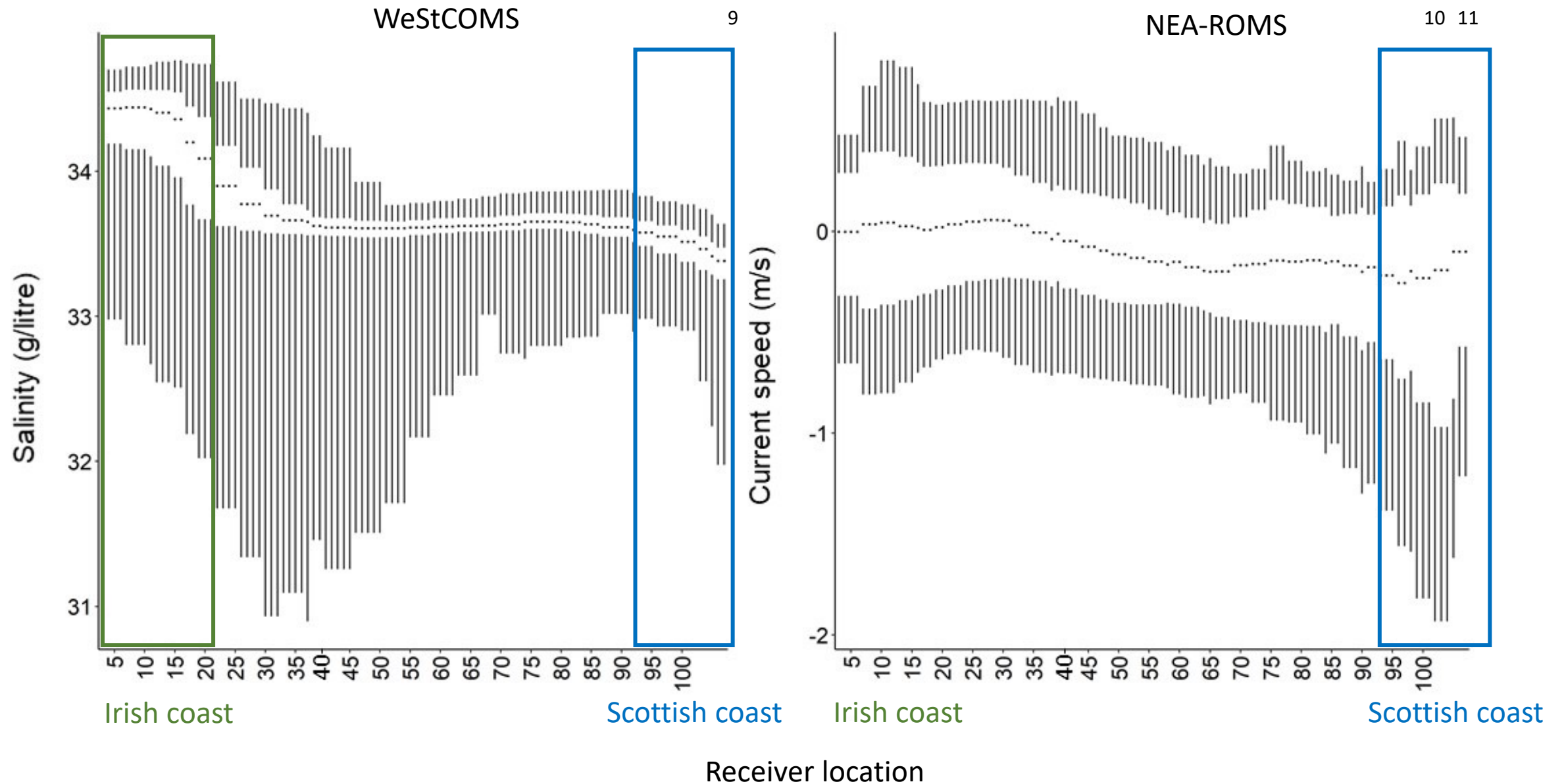


Region 4 (Faughan/Roe)



Do environmental factors influence spatial distribution?

Monitoring Line B



Do environmental factors influence spatial distribution?

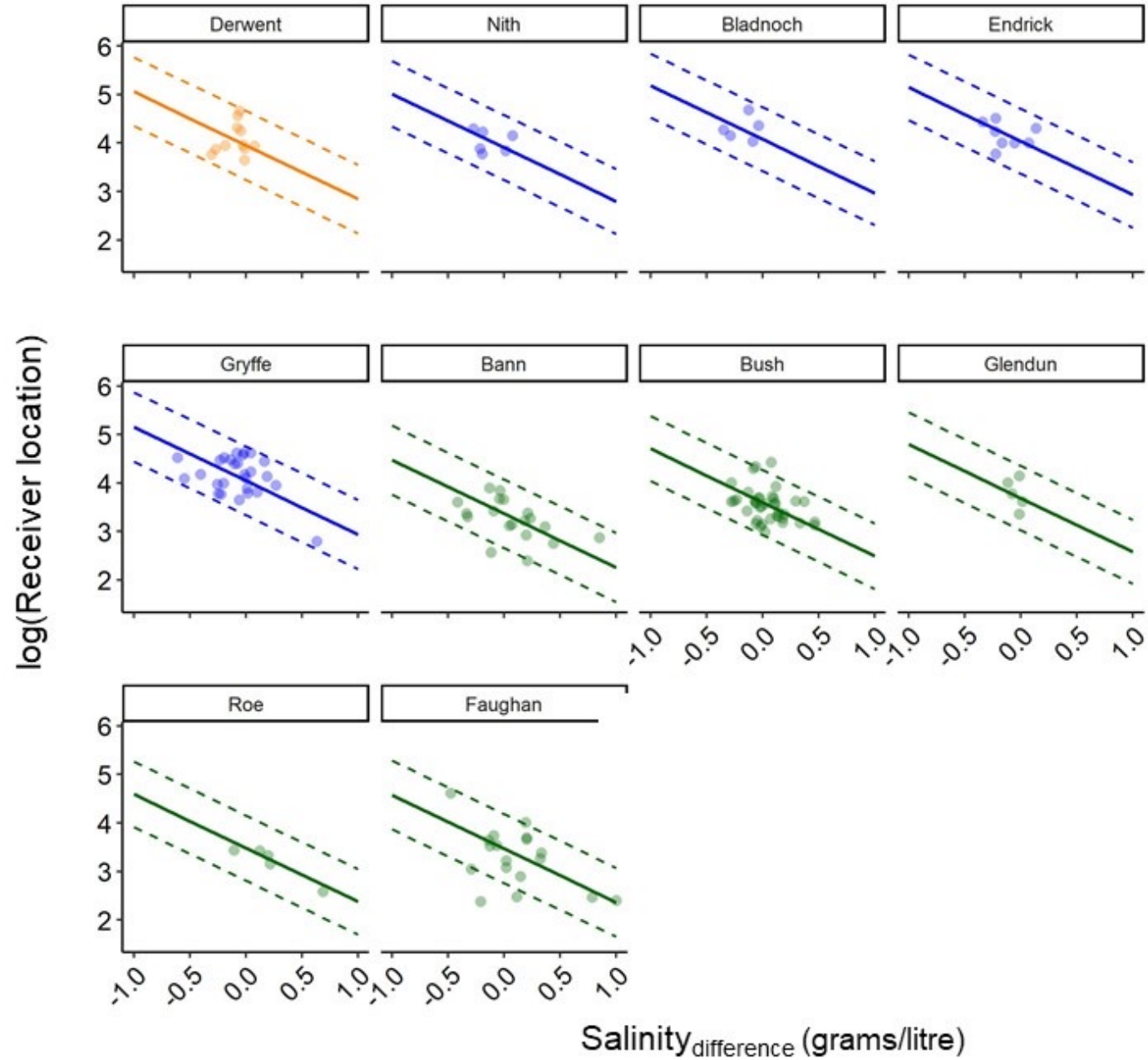
Initial model: $\text{Log}(\text{monitoring point}) \sim \text{Salinity}_{\text{diff}} + \text{Current}_{\text{diff}} + \text{Time_of_Day} (\text{Day/Night}) + \text{Tide_Type} (\text{Ebb/Flood}) + \text{Salinity}_{\text{diff}} * \text{Tide_Type} + \text{Current}_{\text{diff}} * \text{Tide_Type} + (1 | \text{River})$

Environmental difference = relative difference in environmental variables relative to the mean (salinity, current)¹¹

Significant predictor:

- $\text{Salinity}_{\text{diff}}$, value = -1.11, p = 0.05
- Variation explained by $\text{Salinity}_{\text{diff}}$ = 24%
- Variation explained by River = 34%

Do environmental factors influence spatial distribution?



Conclusion

1. Early marine loss rate:^{12,13,14}

- ↑ migration distance
- ↓ smolt size / ≠ date of entry

2. Migratory pathways

- Differences between nations
- Irish coast

3. Environmental drivers of movement^{11,15}

- smolt distribution ~ salinity



Thank you!



SeaMonitor



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Further collaboration

21 rivers

1733 smolts

382 receivers

